

THAUMATOCONCHA POROSA, A NEW SPECIES OF
ABYSSAL OSTRACODE FROM THE INDIAN OCEAN
(HALOCYPRIDA: THAUMATOCYPRIDIDAE)

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Abstract. — *Thaumatoconcha porosa* is described and illustrated from an adult male collected at abyssal depths (3716 m) in the Indian Ocean west of Madagascar (Mozambique Channel). The copulatory organ of the new species differs from that of other species of *Thaumatoconcha* in being more slender. *Thaumatoconcha* has not been reported previously from the Indian Ocean. A second specimen, an A-1 male collected at abyssal depths (4560 m) in the Atlantic Ocean west off South Africa (Cape Basin), is briefly described and illustrated, but is left in open nomenclature, as *Thaumatoconcha* species.

Kornicker and Sohn (1976) proposed the genus *Thaumatoconcha* for nine species (one left in open nomenclature) collected at bathyal and abyssal depths in the Atlantic and Pacific Oceans. Extensive collections from the vicinity of Africa made available to me by the Centre National de Tri d'Océanographie Biologique, Brest, France, provided only two specimens of *Thaumatoconcha*: one from 4560 m in Cape Basin, Atlantic Ocean, the other from 3716 m in Mozambique Channel, Indian Ocean; the latter is the first record of the genus in the Indian Ocean. Both specimens are described herein.

Thaumatoconcha Kornicker and Sohn, 1976

Type-species. — *Thaumatoconcha radiata* Kornicker and Sohn, 1976:35.

Distribution. — Atlantic Ocean, 32°N–73°S; Pacific Ocean, 7°S–70°S; Indian Ocean, 11°44'S, 47°35'E. Known depth range 587–4758 m.

Discussion. — A crescent-shaped scar is clearly visible on the carapace of the new species described herein and, also, on the species left in open nomenclature. The scar is anteroventral to the central adductor muscle attachments (Figs. 1a, b, 4a). On reexamining shells of several species of *Thaumatoconcha* described by Kornicker and Sohn (1976) (*T. hessleri*, *T. species E*, and *T. radiata*) a similar scar was noted, although sometimes poorly developed and indistinct, especially on strongly calcified shells of *T. radiata*. The scar is also visible on the illustration of *T. elongata* presented by Kornicker and Sohn (1976:fig. 41e). The scar is termed *mandibular scar* herein, because I believe it marks the place of attachment of a tendon whose opposite end is attached to the dorsal apex of the mandibular basale. The tendon is similar to that illustrated by Harding (1965:11, fig. 2) on an unidentified ostracode. The mandibular scar was overlooked by Kornicker and Sohn (1976), and probably occurs on all members of *Thaumatoconcha*.

I would like to take this opportunity to correct the legend of figure 48 in Kornicker and Sohn (1976:71) which illustrates the valve of *T. hessleri* USNM 143744, not USNM 143862.

Thaumatoconcha porosa, new species

Figs. 1–3

Etymology.—From the Greek *porosus* (full of holes), in reference to marginal pore canals concentrated in a short zone at midlength of the ventral margin of the carapace.

Holotype.—Adult male on slide and in alcohol, deposited in the Muséum National d'Histoire Naturelle, Paris, France, MNHN Os 78; unique specimen.

Type-locality.—Benthedi cruise, R. V. *Suroit*, station 87-CH, Mozambique Channel, SE of Glorioso Islands, 4 Apr 1977, 11°44'S, 47°35'E, depth 3716 m, bottom trawl.

Description of adult male (Figs. 1–3).—Valves circular, with greatest height near midlength (Fig. 1a, b); straight anteroventral margin with small conical projections at each end lateral to valve edge (Fig. 1d); minute pore present at tip of each protuberance; middle of ventral margin with concentration of 25–30 pore canals (Fig. 1e); shell thickness slightly less in vicinity of pore canals than thickness anterior and posterior to canals (visible when viewed laterally in transmitted light); pores open on outer surface of valve; outer surface of carapace appearing smooth but thin outer layer with faint punctae (especially visible in fragment of shell viewed under cover slip (Fig. 1c).

Central adductor muscle attachments (Fig. 1a, b): consisting of 8–10 wedged-shaped segments radially arranged.

Mandibular scar (Fig. 1a, b): crescent-shaped, concave towards central adductor muscle bundle, located anteroventral to the muscle bundle.

Size: holotype length 1.39 mm, height 1.00 mm.

First antenna (Fig. 2a–c): limb with 8 distinct joints. 1st joint with small lateral bulge bearing bristle with short marginal spines, and dorsal bristle with short marginal spines; medial surface of joint with long hairs. 2nd joint with long spines forming rows on medial surface, short spines on lateral surface, and 2 bristles (1 ventral, 1 dorsal), both with short marginal spines. 3rd joint with hairs along ventral and dorsal margins; 3rd and 4th joints distinctly separated in sclerotized areas of ventral and dorsal margins; 3rd and 4th joints separated by medial and lateral suture on left limb but fused on right limb; length of 3rd joint 63 percent length of 4th joint. 4th joint with 2 long, bare, terminal bristles with stout bases; dorsal margin of joint with few small indistinct spines. 5th joint with 1 long bristle with long, curved, distal hairs on ventral margin (hairs absent near tip), 1 medium length bristle with minute widely spaced marginal spines, and 1 shorter bare bristle with base on medial surface of joint. 6th joint with few minute spines along dorsal margin. 7th joint with 1 short dorsal bristle and 2 long ventral bristles with short, widely separated, marginal spines. 8th joint with 3 bristles (1 short, 1 medium, 1 long), all with widely spaced, minute, marginal spines.

Second antenna (Fig. 2d): protopodite with long hairs along ventral margin. Endopodite 3-jointed (Fig. 2d): 1st joint with long medial hairs near ventral margin and 3 bristles (1 ventral, 2 dorsal); 2nd joint narrower and longer than 1st, with long hairs on ventral margin and on medial surface near ventral margin, and with 4 bristles (1 short, lateral; 4 terminal), all with short marginal spines; 3rd joint with stout, sclerotized, curved, hook-like process with 2 spines at tip; surface pustulose, near tip. Exopodite with 8 joints; joint 1 divided by suture into long

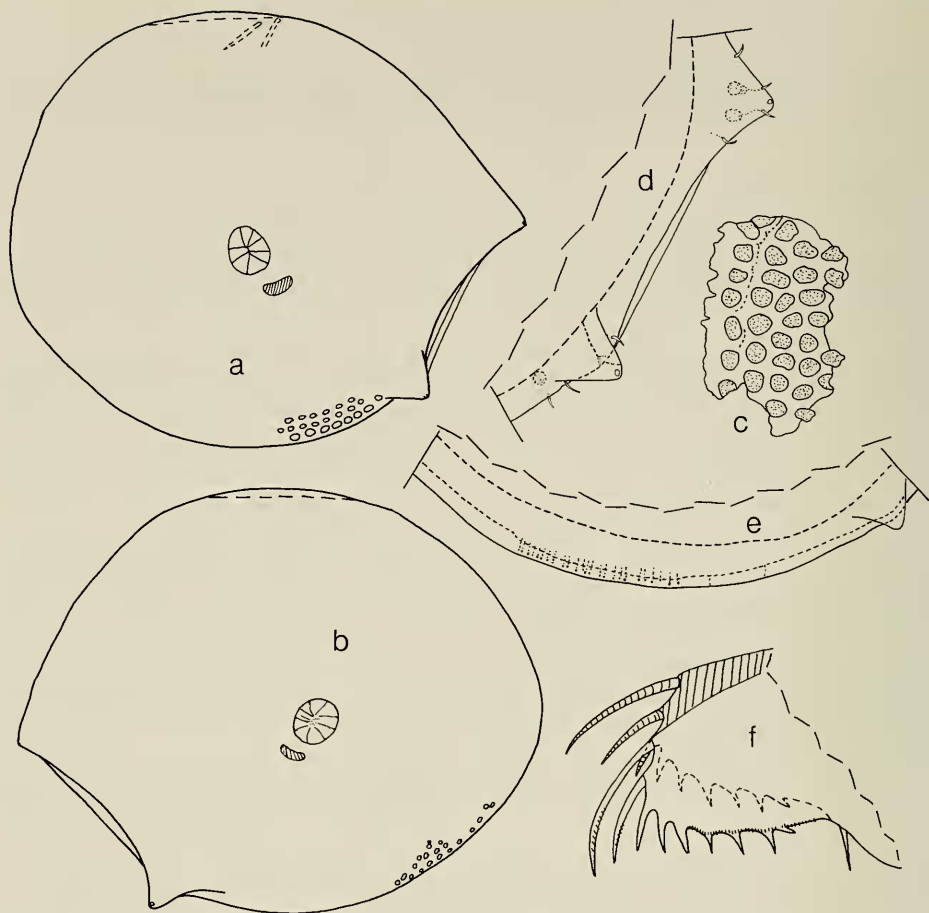


Fig. 1. *Thaumatoconcha porosa*, adult male, holotype, MNHN Os 78, length 1.39 mm: a, Lateral view of complete specimen from right side showing central muscle attachments, mandibular scar (lined pattern), some punctae at lower right, and dashed lines near dorsal margin representing the linear hinge and distal ends of 2 dorsal muscles; b, Lateral view of left valve somewhat flattened; c, Fragment of shell under cover slip showing punctae; d, Lateral view of anteroventral part of right valve showing pores at tip of conical protuberances and short marginal hairs; e, Lateral view of ventral margin of right valve showing concentration of pores near midlength; f, Caudal lamellae of furca (anterior of right lamella with pattern), and the individual process on posterior of body following laminae.

proximal and short distal parts; bristle of 2nd joint with narrow spines and distal natatory hairs (spines on proximal half of bristle on 1 limb, and on distal half on other limb); bristles of joints 3–8 with natatory hairs, no spines; 9th joint with 1 long bristle with small spines near middle and distal natatory hairs, and 1 shorter bristle (less than $\frac{1}{2}$ length of long bristle) with slender widely spaced spines, no natatory hairs; some joints with minute distal spines forming short row.

Mandible (Figs. 2e, f, 3b): Coxale endite with proximal and distal sets of teeth separated by small space (Fig. 2e). Proximal set of teeth comprising 4 teeth (proximal of these with 1 pointed cusp; distal 3 with 4 cusps); densely arranged spines between teeth and extending onto medial surface of endite; lateral surface proximal to teeth with long spines forming rows. Distal set of teeth consisting of 2 stout

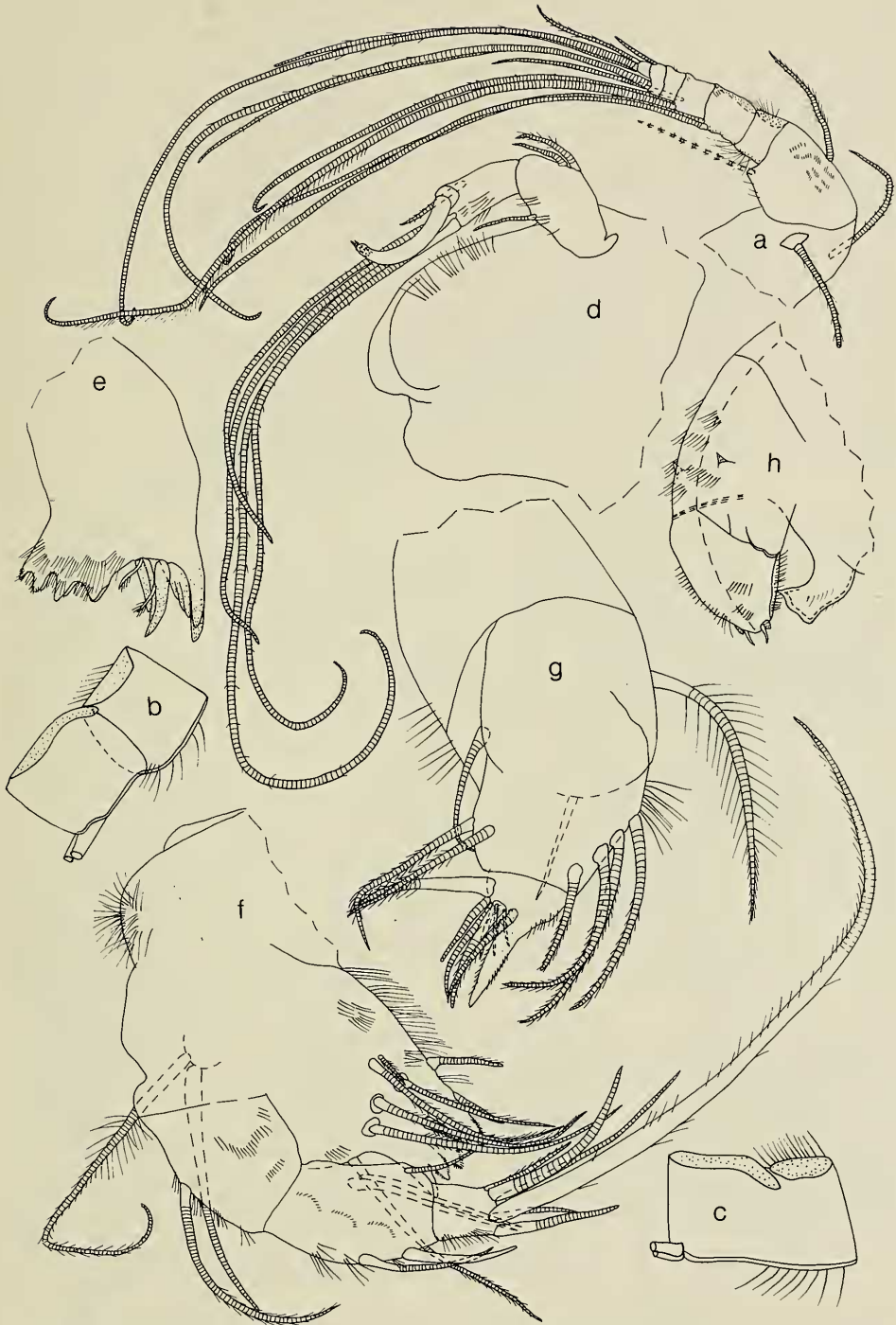


Fig. 2. *Thaumatoconcha porosa*, adult male, holotype, MNHN Os 78: a, Lateral view of left 1st antenna; b, Lateral view of 3rd and 4th joints of left 1st antenna; c, Medial view of 3rd and 4th joints of right 1st antenna; d, Medial view of protopodite and endopodite of right 2nd antenna; e, Medial view of distal end of coxale endite of left mandible; f, Lateral view of basale and endopodite of left mandible; g, Maxilla (endites not shown); h, Upper and lower lips, anterior to left.

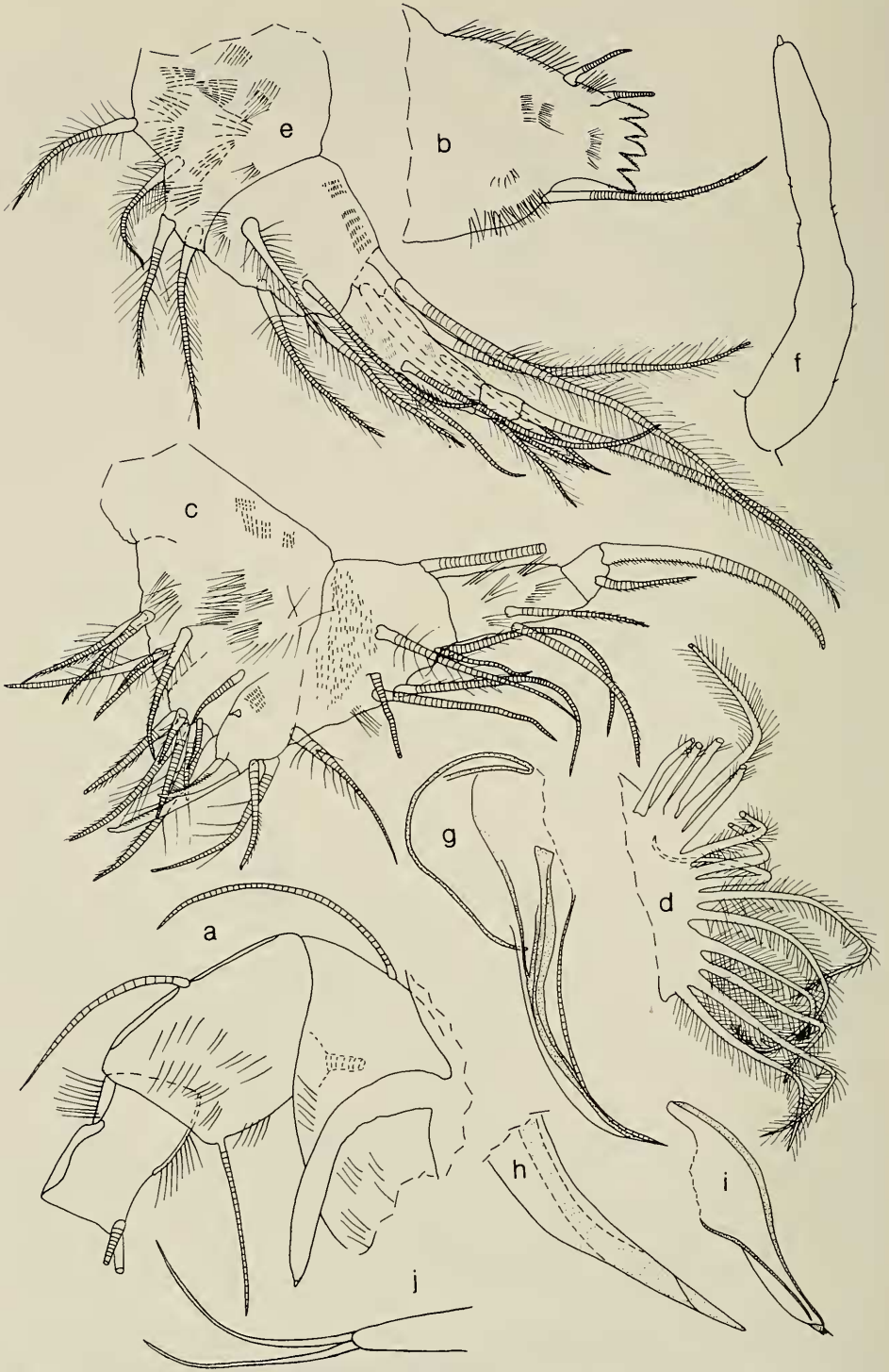


Fig. 3. *Thaumatoconcha porosa*, adult male, holotype, MNHN Os 78: a, Medial view of joints 1-4 of right 1st antenna, and Bellonci organ; b, medial side of distal part of basale of right mandible; c,

teeth; inner tooth comprising 1 stout and 5 or 6 smaller pointed teeth; outer tooth with 6 cusps; 2 bristles with spinous tips present at base of distal set of teeth. Basale (Figs. 2f, 3b): teeth of endite with 5 triangular cusps with minute serrations along margins; posterior margin of endite with 1 proximal bristle with marginal spines and 1 bare distal bristle with blunt tip; anterior margin of endite with 1 long spinous bristle; lateral side of endite with long hairs; 5 spinous bristles, and short, stout, distal, triangular process with minute teeth along anterior edge and curved tip (this process somewhat hidden behind bristles of illustrated limb, Fig. 2f); medial side of basale with mound bearing 2 long bristles (outer with long proximal and short distal spines, inner bare). Endopodite 3-jointed (1st and 2nd joints about same length, 3rd joint narrower and about $\frac{1}{2}$ length of other joints) (Fig. 2f); 1st joint with 1 spinous dorsal bristle, and spines on lateral and medial surface and along dorsal margin; ventral margin of 2nd joint with 2 long bristles near midlength and 1 shorter distal bristle; dorsal margin of 2nd joint with 1 annulate proximal bristle and 1 non-annulate, distal, claw-like bristle; terminal end of 3rd joint with 3 lateral bristles (middle of these claw-like and about 3 times length of longer other bristles), and 3 slender ventral bristles.

Maxilla (Fig. 2g): endite I with 12 bristles, endites II and III obscure but each with about 9–11 bristles, some bristles flat, pectinate. Boundary between coxale and basale not well defined; basale with 3 bristles (some of these could be on coxale; dorsal bristle with long proximal and short distal spines). Endopodite: 1st joint hirsute, with 4 spinous bristles on anterior (dorsal) margin, and 2 spinous distal bristle on posterior (ventral) margin; anterior margin of end joint spinous; terminal end of end joint with total of 8 or 9 bristles (anterior bristle linear, claw-like, with minute teeth along edges; posterior bristle curving anteriorly, with marginal spines, remaining bristles spinous).

Fifth limb (Fig. 3c, d): epipodial appendage with bristles in 3 groups, each with 5, 5, and 4 (distal group) plumose bristles. Protopodite, basale, and endopodite with total of 19–21 bristles; endopodite with short, triangular, tooth-like process. Exopodite 3-jointed: 1st joint with long, spinous, dorsal bristle, and 6 bristles closer to ventral margin; 2nd joint hirsute, slender, longer than 1st, with 2 bristles on or near ventral margin at mid-length; end joint with 1 short spinous bristle and 1 long claw-like bristle with spines along ventral margin (short bristle 35–37 percent length of long bristle).

Sixth limb (Fig. 3e): epipodial appendage with bristle in 3 groups, each with 6, 4, and 5 (distal group) plumose bristles. Protopodite hirsute, with 4 bristles on or near ventral margin. Exopodite 4-jointed: 1st joint divided by weak suture into proximal part with 2 ventral bristles, and distal part with 2 ventral bristles and small dorsal process with 3 plumose bristles; 2nd and 3rd joints fused, hirsute, with 3 spinous bristles (2 midventral, 1 dorsal); end joint with 1 short spinous bristle and 1 long claw-like bristle with short spines along ventral margin (short bristle 26–31 percent length of long bristle).

Seventh limb (Fig. 3j): small with 2 long bristles.

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5th limb, epipodial appendage not shown; d, Epipodial appendage of 5th limb; e, 6th limb, epipodial appendage not shown; f, Organ of Bellonci; g, Anterior part of copulatory organ; h, Tip of organ shown in g; i, Posterior part of copulatory organ, j, 7th limb.

Furca (Fig. 1f): each lamella with 2 long anterior claws separated from lamella by suture, followed by 6 short claws and 1 short backward pointing process (claws and process not separated from lamella by suture); all claws with minute teeth; ventral part of lamella with minute spines; right lamella anterior to left.

Bellonci organ (Fig. 3a, f): elongate, reaching just past distal end of 2nd joint of 1st antenna; with few marginal hairs, and minute process on rounded tip.

Posterior of body (Fig. 1f): single slender process present proximal to furcal lamella; posterior margin of body divided into narrow segments (segments without sclerotized substructures).

Lips (Fig. 2h): ventral end of upper lip projecting posteriorly, with 2 short outer processes and 2 narrower inner pointed processes; small triangular process on each side of body proximal to upper lip. Lower lip consisting of 2 triangular flaps, each with sclerotized pointed process at tip.

Copulatory organ (Fig. 3g-i): single organ on left side of body consisting of 2 parts: anterior part elongate, curved, tapering to acuminate tip (Fig. 3g, h); posterior part shorter than anterior part, with 2 or 3 spines on sclerotized tip (Fig. 3i).

Comparisons.—The narrow copulatory organ of the male *T. porosa* separates the species from other species of *Thaumatoconcha* of which the male is known. The 1st endopodial joint of the maxilla of *T. porosa* bears fewer bristles (6) than other *Thaumatoconcha* (7–10) (Kornicker and Sohn 1976: tab. 13). Only three *Thaumatoconcha* have 1st antennae with the 3rd joint not longer than the 4th (*T. porosa*, *T. hessleri* Kornicker and Sohn, 1976:71, and *Thaumatoconcha* species A. Kornicker and Sohn, 1976:91). Only females are known for the last two species. The carapace of *T. porosa* differs from that of *T. hessleri* and *Thaumatoconcha* species A in having 25–30 marginal pore canals concentrated in a short zone near midlength of the ventral margin; wall thickness of the shell is thinner in the pore-zone (Fig. 1e). Because marginal pore canals were not described by Kornicker and Sohn (1976), I examined two paratypes of *T. hessleri* (USMN 143755, 144006) and the unique specimen of *Thaumatoconcha* species A (USMN 143862); pore canals along the ventral margin of the carapace of both species are more or less evenly distributed, and wall thickness of the shell along the ventral margin is constant. The length of the carapace of the unique male *T. porosa* (1.39 mm) is smaller than that of previously described males of other species (1.59–1.99 mm).

Thaumatoconcha species

Fig. 4

Material.—1 A-1 male, Walvis I cruise, R. V. *Jean Charcot*, station B, sample DS-05, Cape Basin, 30 Dec 1978, 33°20'05"S, 2°34'09"E, depth 4560 m, epibenthic dredge. Specimen deposited in the Muséum National d'Histoire Naturelle, Paris, France, MNHN Os 79.

Description (Fig. 4).—Carapace decalcified; anteroventral margin between ventral and dorsal processes slightly concave on right valve (Fig. 4a) but linear on left; surface with shallow punctae and without posterodorsal processes; ridges paralleling anteroventral margin indistinct (probably because of carapace being decalcified); marginal pores more or less equally distributed along ventral margin.

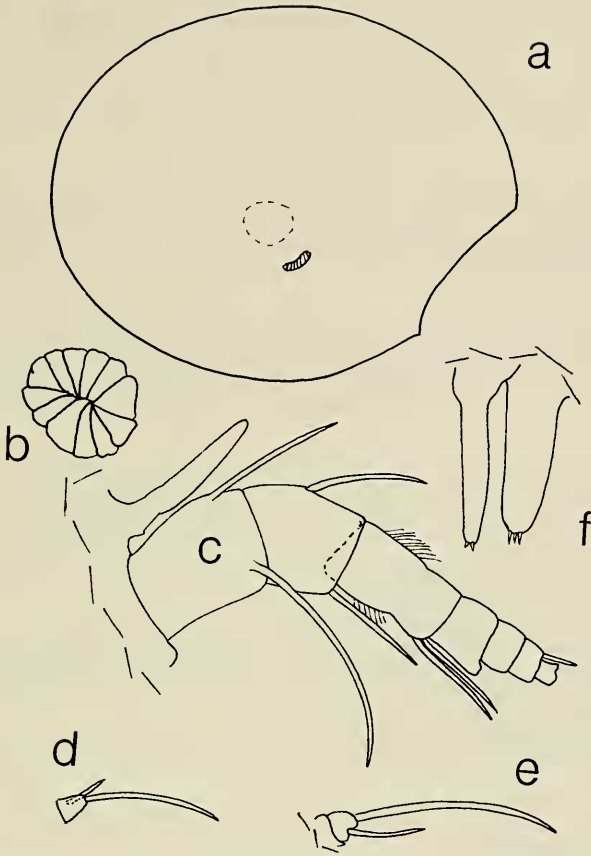


Fig. 4. *Thaumatoconcha* species, juvenile male (A-1 instar), MNHN Os 79, length 1.32 mm: a, Lateral view of complete specimen from right (dashed circle represents position of central adductor muscle attachments, crescent with lined pattern represents mandibular scar; b, Lateral view of central adductor muscle attachments of right valve; c, Medial view of left 1st antenna (not all bristles shown), and Bellonci organ; d, End joint of 5th limb; e, End joint of 6th limb; f, Copulatory organ, anterior to left.

Central adductor muscle attachments (Fig. 4b): consisting of about 12 radial scars.

Mandibular scar (Fig. 4a): consisting of small crescent-shaped scar anteroventral to central adductor bundle.

Size: length 1.32 mm, height 1.13 mm, length to height ratio 1.17.

First antenna (Fig. 4c): 1st joint with 2 bristles (1 lateral, 1 dorsal). 2nd joint with 1 dorsal midbristle and 1 ventral terminal bristle. 3rd and 4th joints fused; 3rd joint longer than 4th (Fig. 4c), with dorsal and ventral spines; 4th joint with 2 terminal ventral bristles reaching middle of 7th joint. 5th joint with 3 terminal ventral bristles (1 short, 2 long). 6th joint bare. 7th joint with 1 short dorsal bristle and 2 long ventral bristles. 8th joint with 3 terminal bristles (shortest of these dorsal).

Second antenna: protopodite bare. Endopodite 3-jointed: 1st joint with 3 bristles

(1 ventral, 2 dorsal); 2nd joint with 5 bristles (1 lateral, 4 ventral); 3rd joint, short, thumb-shaped, with 5 short terminal bristles. Exopodite with 9 joints; 1st joint divided into 2 parts (proximal of these longer than other); joints 2–8 each with 1 long bristle with distal natatory hairs; 9th joint with 2 long bristles with natatory hairs.

Mandible: basale with 3 bristles (1 anterior, 2 posterior); lateral side with 5 bristles and short triangular process with curved tip; medial side with 2 bristles. Endopodite: 1st joint with 1 dorsal bristle; 2nd joint with 3 ventral and 2 dorsal bristles; 3rd joint with 6 bristles.

Maxilla: 1st endopodial joint with 6 anterior and 2 posterior bristles.

Fifth limb: epipodial appendage with bristles forming 3 groups of 5, 5, and 4 (distal group) bristles. 2nd exopodial joint with 2 midbristles (1 ventral, 1 medial). 3rd exopodial joint with 2 unequal bristles (short bristle 31 percent length of long bristle) (Fig. 4d).

Sixth limb: epipodial appendage with bristles forming 3 groups of 4 or 5, 4, and 5 (distal) bristles. Exopodite: 1st joint with 4 bristles, and process on dorsal corner bearing 3 plumose bristles; 2nd joint with 3 bristles (2 midventral, 1 dorsal); 4th joint with 2 bristles (shorter of 2 missing on right limb); short bristle of 4th joint 42 percent length of long bristle (Fig. 4e).

Seventh limb: with 2 long bristles (shorter $\frac{3}{4}$ length of other).

Furca: each lamella with 2 anterior claws separated from lamella by suture, followed by 5 shorter claws fused to lamella, and then short backward pointing process. Right lamella slightly anterior to left.

Bellonci organ: elongate, reaching past 1st joint of 1st antenna, with rounded tip (Fig. 4c).

Posterior of body: 1 slender process posterior to furcal lamellae; body dorsal to slender process segmented.

Copulatory organ (Fig. 4f): consisting of long slender anterior part with minute spines at tip, and shorter sausage-shaped posterior part with 3 small bristles at tip.

Remarks.—Juveniles of this genus are difficult to identify with a high degree of certainty. The present specimen has a copulatory organ that conceivably could develop in the adult to be like that of *C. porosa*, but the specimen differs from the latter species in having the 3rd joint of the 1st antenna longer than the 4th. It also differs in that respect from two other species, *T. hessleri* and *Thaumatoconcha* species A. The great difference in lengths of the bristles of the end joint of the 6th limb indicates that the present specimen is not *T. radiata*. The rounded tip of the Bellonci organ indicates that it is not *T. punctata*. The slender anterior lobe of the copulatory organ makes it unlikely that it is any of the species that have a broad anterior lobe on the adult copulatory organ (*T. caraionae*, *T. elongata*, *T. polythrix*, *T. radiata*, *T. sandersi*, *T. tuberculata*).

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